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Climate history at Aurora Basin North, East Antarctica: A 2,000 year isotopic record

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In Antarctica, a reasonable coverage of ice core records exist for the last couple of hundred years, however there is poor spatial coverage of high-resolution climate data over the last 2000 years, particularly from East Antarctica (EA). The aim of the Aurora Basin North (ABN) ice core drilling project is to provide a 2000 year climate record from a data sparse area of EA to add to the IPICS 2k array and the PAGES Antarctica2k projects. ABN is a 303m ice core from EA, 550km inland and about half way between the coastal Law Dome and inland Dome C sites. Contiguous measurements of water stable isotope ratios (d18O and dD) have been performed along the entire length of the ABN ice core and provides a climate record at seasonal to decadal resolution for this region of EA spanning the past ∼2000 years. The isotopic variability at ABN shows clear annual cycles in the upper ∼50 m and longer-term variability on decadal to centennial timescales. The ABN record shows no long-term isotopic trend over the ∼2,000 year record length, similar to the four isotopic ice core records used in EA for the PAGES Antarctic 2k temperature reconstruction (PAGES2k, 2013). Mean ABN isotopic values (d18O -40.70 per mille, and dD -321.1 per mille) fall along the modern Antarctic spatial isotope/elevation and isotope/distance from the ocean relationships. The second order isotope parameter, deuterium excess (d) displays a relatively stable record (mean value of 4.4 per mille), with occasional sharp transitions to values as high as 8-10 per mille and as low as 0-1 per mille =. The large deuterium excess variations may reflect changes in moisture origin and evaporation conditions (SST, relative humidity). The isotopic variability at ABN therefore potentially reflects a mix of changes in transport and local climate (acting on precipitation intermittency and distillation strength), as well as local elevation changes. A comparison of the preliminary dated ABN isotope record with the Law Dome isotopic record shows that they are correlated, despite the differences in site-specific influences. This correlation indicates a common climate signal at both sites and a spatial coherence in regional climate from the coastal Law Dome to the inland plateau of the ABN site.